JPL Biotechnology and Planetary Protection Group

Protecting the Planets

An Overview of JPL's Planetary Protection Center of Excellence

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California Institute of Technology

This is NOT Planetary Protection.

(Pixabay Images, 2018)

What is Planetary Protection?

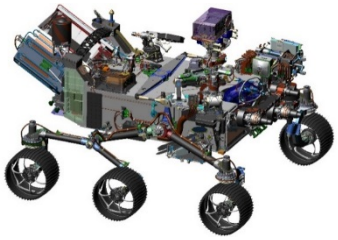
- **Planetary Protection** addresses microbial contamination of the solar system:
  - Spacecraft that we launch from Earth (forward contamination)
  - Contamination of the Earth and Moon (backward contamination), from restricted sample return missions

- To prevent either forward or backward contamination, spacecraft hardware must be cleaned and/or sterilized then evaluated for the presence of microorganisms.
  - Cleanroom environments
  - Cleaning the hardware
  - Routinely sample the cleaned hardware

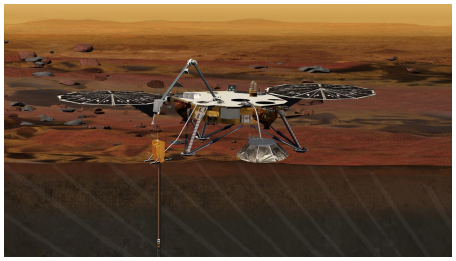
(Thinkstock, 2018)

Biotechnology and Planetary Protection Group

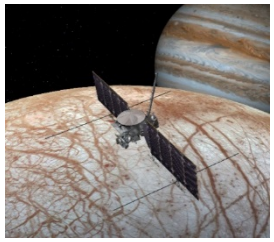
- **Charter Statement**
  - The paramount goal of planetary protection is to enable and enhance NASA's ability to preserve the scientific integrity of current and future solar system exploration.
  - As JPL's Center of Excellence in this discipline, the JPL Biotechnology and Planetary Protection Group has the responsibility to:
    - Ensure mission compliance with internationally agreed planetary protection requirements through implementation of NASA policy
    - Provide advocacy and education to the scientific, project and programmatic communities regarding the role of planetary protection.
- **Goals**
  - To enable NASA Planetary Protection (PP) compliance for JPL missions
    - Life detection and/or Restricted Sample Return
    - Develop technology and capabilities and perform research to support spacecraft design and implementation
  - Play an integral role in planning for humans to explore Mars



Mars2020



InSight



Europa Clipper

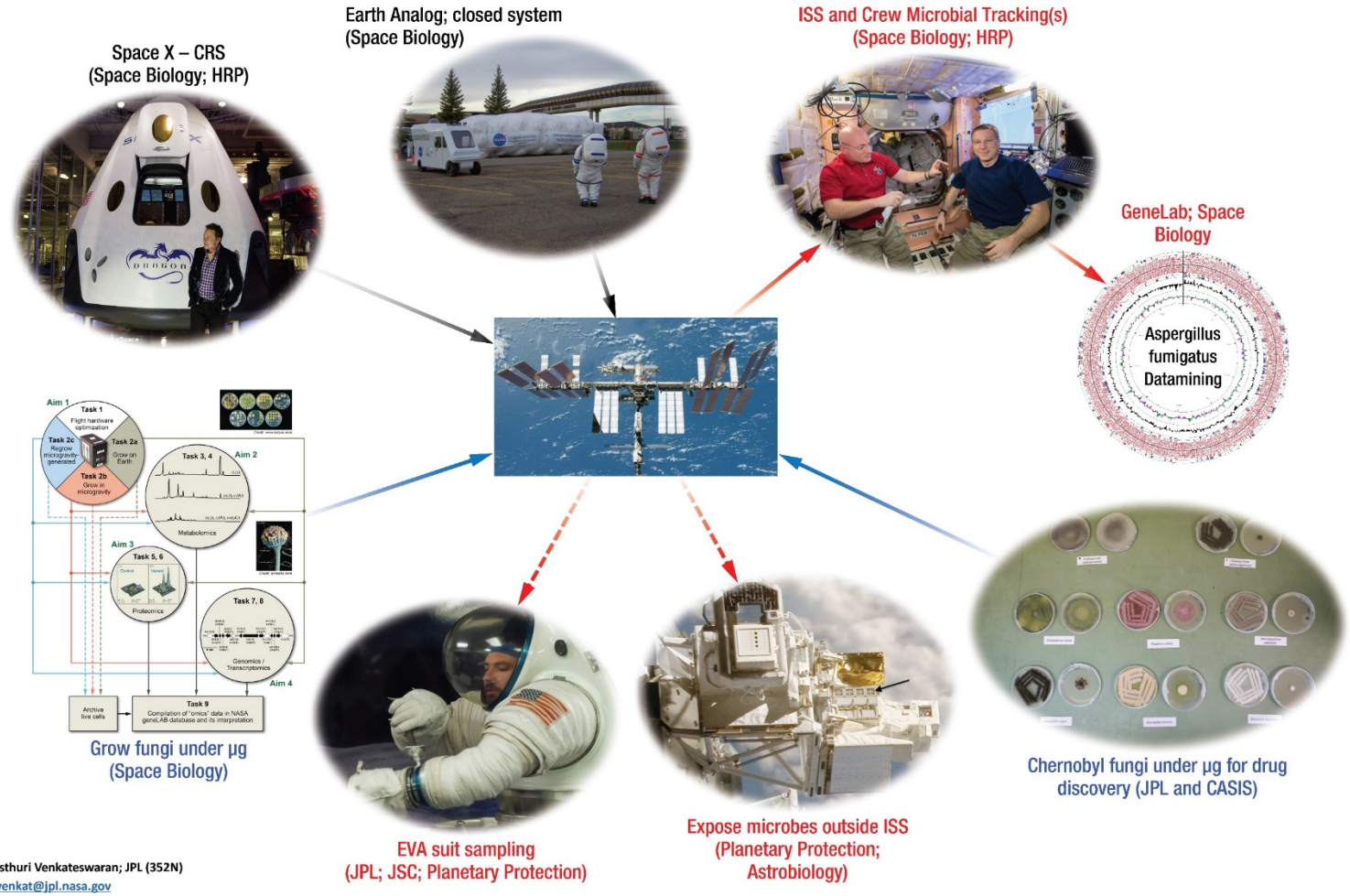
Personnel and Capabilities

- 29 people in currently group - 40% bachelor, 20% masters, 40% PhD
- Many partnerships with cutting edge research labs and contracts

- **Expertise**
  - **Microbiology and Molecular Biology**
    - Cleanroom and spacecraft low biomass identification
    - Biological contamination control
    - Bioinformatics, space biology, microbial reduction and sterilization modalities, biomaterial storage
  - **Engineering**
    - Systems engineering – integral part in life detection instrument development, requirements flow, etc.
  - **Flight Implementation and Research**
  - **Biodetection Assays** (NASA Standard Assay, spore, Adenosine triphosphate, *Limulus amebocyte lysate*)
  - **Genetic Inventory**
  - **Spacecraft Microbial Archive**

PP Research and Development

JPL Projects on Space Biology
and Its Relationship with Planetary Protection, Astrobiology, and HRP



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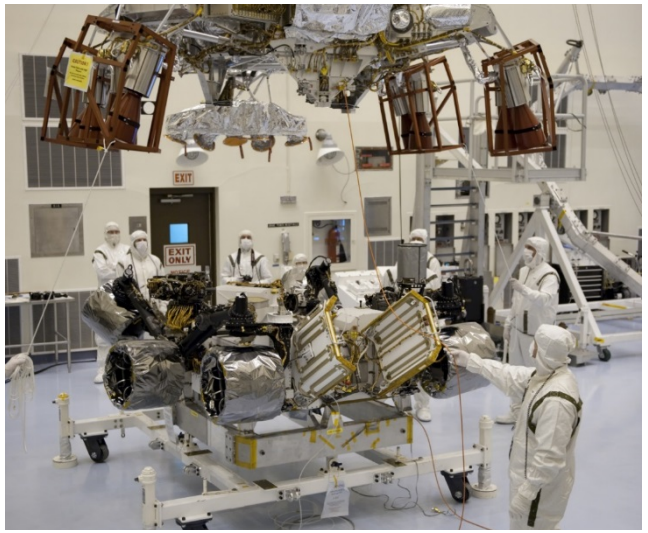
PP Mission Support

Current Missions

- InSight
- Mars 2020
- Europa Clipper

Future Mission Studies

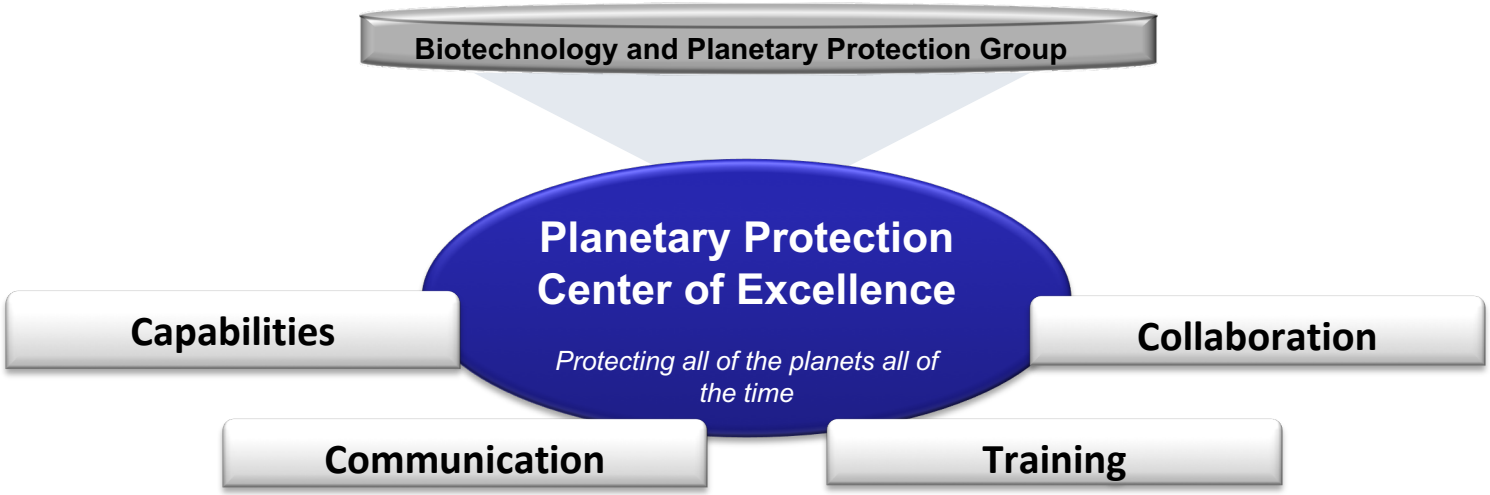
- Europa Lander Concept
- Concepts for Mars Sample Return



Planetary Protection Center of Excellence

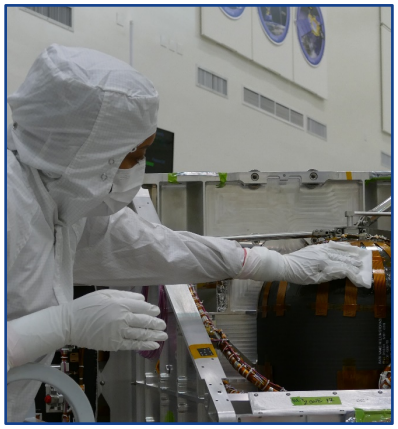
Strategic Importance

- Helps promote and retain an institutionally recognized core capability
- Driver for staying at the “cutting-edge” of PP and technology development (bioinformatics, biodetection, bioassay, and sampling)
- Provides framework for interdisciplinary, collaborative problem solving
- Promotes visibility of expertise that can help stimulate intra/interagency collaborations
- Recruit quality key personnel to build and train for the future
- Method for supporting/advocating for investment in maintaining required infrastructure/facilities

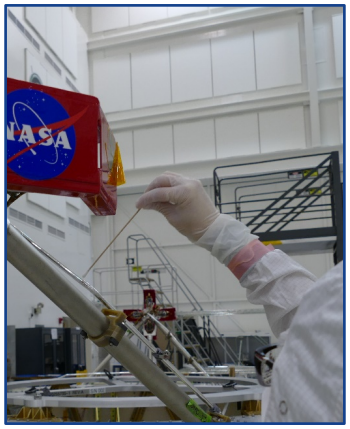


Capabilities

Flight Support Lab & Space Microbiology Lab



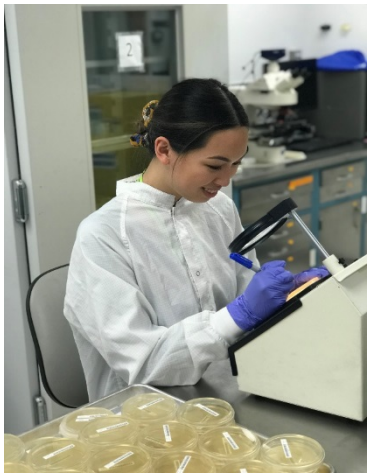
Sample Hardware (e.g. wipe)



Sample Hardware (e.g. swab)

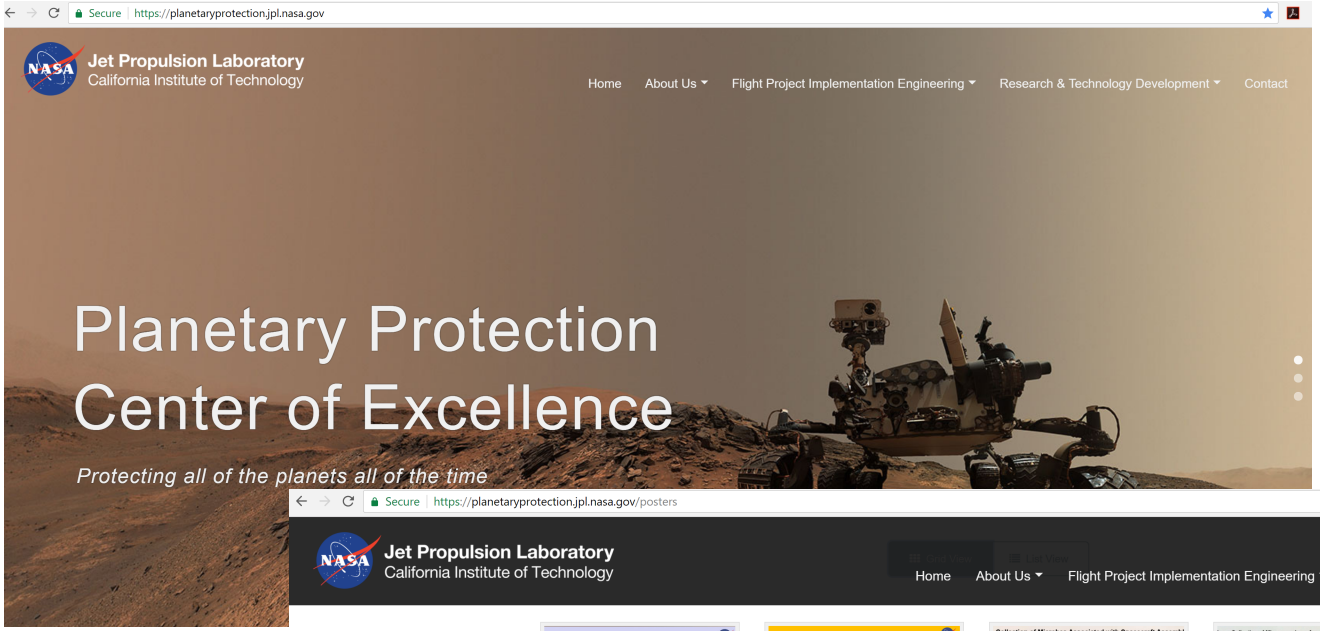
Microbial Archive

Microbiological Characterization



Counting Plates

Communication (https://planetaryprotection.jpl.nasa.gov)



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Training

Current Staff Training/Refresh

Internships

Conferences and Workshops

AMERICAN SOCIETY FOR MICROBIOLOGY

AbGradCon 2018
ASTROBIOLOGY GRADUATE CONFERENCE
Atlanta, GA
June 4-8, 2018

2018 INTERNATIONAL MARS SAMPLE RETURN CONFERENCE BERLIN

COSPAR 2018
42ND ASSEMBLY
69TH ANNIVERSARY

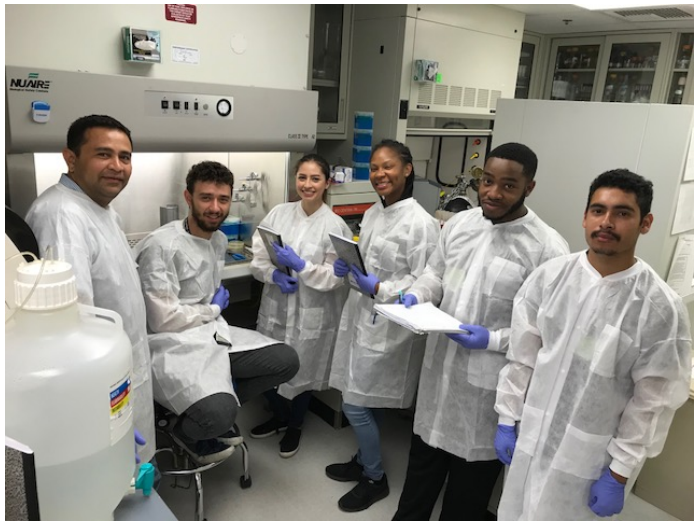
BIODETECTION TECHNOLOGIES:
Biothreat and Pathogen Detection

Multi-Institutional Collaboration for Research Opportunities (MICRO)

Engaging Minority Undergraduate Students in Planetary Protection Research

- The key objective of project MICRO is to offer highly motivated students from the HBCU/MSIs the opportunity work in JPL laboratories to characterize novel bacterial species isolates from spacecraft.
  - Perform biochemical, physiological and genetic tests
  - Learn data analysis and bioinformatics
  - Contribute to manuscript writing
  - Potential to name a novel organism

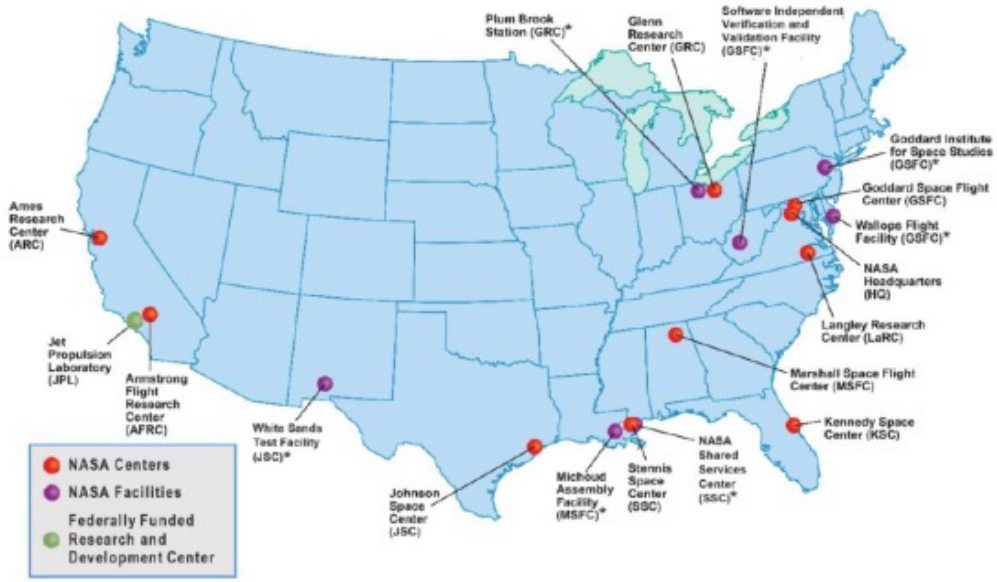
- Contribute significantly to NASA's Planetary Protection efforts
- Increase diversity at JPL and the number of students who successfully transfer to Ph.D. programs, academic and industry research



2018 MICRO Student with PP Engineers
- *Alabama A&M University*
- *CSU Northridge*

Collaborations

NASA Centers and Facilities



Industry

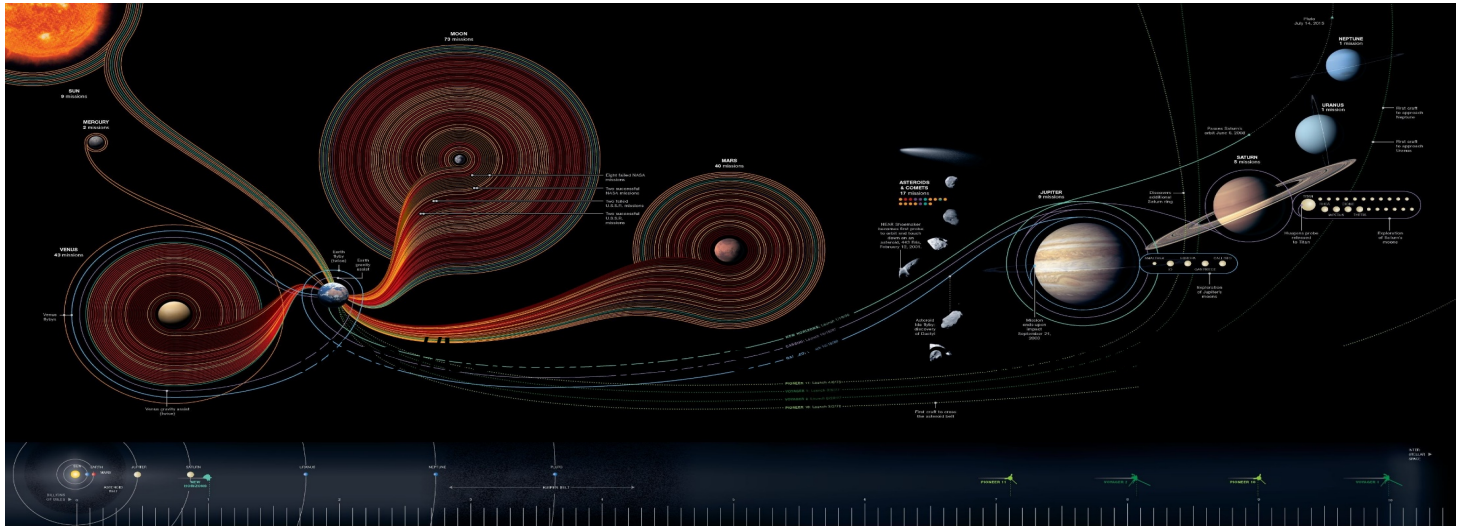
(Thinkstock, 2018)

Universities

Government Agencies

JPL Missions & Planetary Protection

Since 1958 NASA's Jet Propulsion Laboratory has taken part in more than **100 missions** and instruments designed to explore our Earth, solar system and beyond.



Planetary Protection will continue to be at the center of exploration protecting the planets and preserving science!

Planning for human exploration

Contact Information

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